

Perceived social norms and concussion-disclosure behaviours among first-year NCAA student-athletes: implications for concussion prevention and education

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ABSTRACT

Timely disclosure and identification of concussion symptoms are essential to proper care. Perceived social norms are a potential driving factor in many health-related decisions. The study purpose was to describe concussion disclosure behaviours and identify the association between perceived social norms and these disclosure behaviours. First-year student-athletes ($n = 391$) at two NCAA institutions completed a cross-sectional survey about concussion disclosure and disclosure determinants. Log-binomial regression models identified factors associated with concussion disclosure behaviour prevalence for: higher intention to disclose symptoms, disclosed all at time of injury, eventually disclosed all, and never participated with concussion symptoms.

More favourable perceived social norms were associated with higher prevalence of intention to disclose (PR = 1.34; 95%CI: 1.18, 1.53) and higher prevalence of never participating in sports with concussion symptoms (PR = 1.50; 95%CI: 1.07, 2.10). Clinicians, coaches, sports administrators, and healthcare practitioners should be mindful of the need to create supportive social environments to improve concussion symptom disclosure.

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Introduction

Timely identification of concussion is essential to proper care and management. (McCrory et al., 2017). In many cases, this identification relies on athlete self-disclosure or disclosure by a teammate at various points following a concussive injury. (Granito, 2002) Disclosure is primarily discussed as the initial injury report. However, concussion disclosure is a repetitive

decision-making process that may occur in various contexts including, but not limited to games, practices, training sessions, and during the return-to-learn and play progressions. Additionally, data from multiple settings illustrate this complex identification and disclosure process involves multiple levels of society and sport. (Craig, Lininger, Wayment, & Huffman, 2019; Register-Mihalik, Baugh, Kroshus, Kerr, & Valovich McLeod, 2017)

Regardless of the context, disclosure of concussion symptoms includes a complex interplay of decisions influenced by factors both internal and external to student-athletes. Current literature about National Collegiate Athletic Association (NCAA) and high school student-athletes highlight factors such as the desire to continue to play, not wanting to let teammates/coaches down, and not knowing an event was a concussion as primary reasons for non-disclosure. (Chrisman, Quitiquit, & Rivara, 2012; Delaney, Caron, Correa, & Bloom, 2018; Delaney, Lamfookon, Bloom, Al-Kashmiri, & Correa, 2015; Kerr, Register-Mihalik, Kroshus, Baugh, & Marshall, 2016; Kroshus, Baugh, Daneshvar, & Viswanath, 2014) Studies specific to NCAA student-athletes also suggest various social pressures (e.g. coaches, teammates, and parents) and general attitudes about concussion influence disclosure behaviours and perceived social norms. (Conway et al., 2018; Kroshus, Baugh, Stein, Austin, & Calzo, 2016; Kroshus, Garnett, Hawrilenko, Baugh, & Calzo, 2015; Register-Mihalik et al., 2018). Additionally, intention to disclose has been a factor closely associated with disclosure behaviours and potentially serves as an important marker of concussion disclosure culture (Kroshus, Baugh, Daneshvar, Nowinski, & Cantu, 2015; Kroshus et al., 2014; Register-Mihalik et al., 2013). These findings are of particular importance as they are grounded in strong theoretical constructs to guide our understanding concerning disclosure behaviours and potential opportunities for intervention. Both the Socioecological Model (Kerr et al., 2014; Register-Mihalik et al., 2017) and the Theory of Planned Behaviour (Fishbein & Ajzen, 2010; Kroshus et al., 2014; Register-Mihalik et al., 2013) have been cited as successful models to examine and frame key areas of need and potential intervention opportunities within concussion disclosure. These models allow for consideration at multiple levels in the sporting environment and reinforce the role of both organization culture and perceived social norms in health behaviours.

Few studies have directly addressed perceived social norms as a primary factor related to concussion disclosure behaviours. However, given the context of sport and the importance of team and organizational culture, these norms are likely a key factor in decision-making for student-athletes. The few studies that have included perceived social norms as possible factors associated with concussion disclosure behaviours observed that these norms may influence at least disclosure intentions (Kroshus et al., 2014; Kroshus, Garnett, Baugh, & Calzo, 2015; Register-Mihalik et al., 2013) and may be important targets for interventions to improve future concussion symptom disclosure. (Kroshus, Kubzansky, Goldman, & Austin, 2015)

Athletes transition to a new life and sport setting during their first-year as student-athletes, presenting an opportune time to address perceived social norms and existing perceptions. Specifically, this time of transition represents a pivotal opportunity to set expectations and educate NCAA student-athletes about concussion and disclosure. First-year student-athletes may bring with them various experiences from high school, as well as expectations of what may happen in their new sport and school environment. However, no studies to date have specifically focused on this key transitional group of student-athletes at this unique life-stage. Thus, understanding the role of perceived social

norms at this pivotal time point may inform future interventions to promote safer concussion disclosure behaviours for NCAA student-athletes.

Therefore, the purpose of this study was to: 1) describe disclosure behaviours ranging from intention to disclose through participation with signs and symptoms and 2) identify the association between perceived social norms when controlling for gender and previous concussion history among first-year civilian and service academy cadet NCAA Division I student-athletes. We hypothesized that more favourable perceived social norms would be associated with positive disclosure behaviours and higher intention to disclose concussive symptoms.

Materials and methods

Design and participants

The current study was a cross-sectional survey design inclusive of a questionnaire assessing concussion disclosure behaviours and determinants of disclosure. First-year cadets at a single service academy ($n = 972/1150$; 84.5% response; 281/972 first-year NCAA student-athletes) and multi-year student-athletes at a single traditional civilian institution ($n = 350/379$; 92.3% response; 110/350 first-year NCAA student-athletes) completed the survey. For the purpose of this study, only NCAA first-year student-athletes from both institutions were included ($n = 281$ service academy, $n = 110$ traditional NCAA institution, total $n = 391$). The study was approved by institutional review boards from each institution prior to any participant interaction.

Instrumentation and procedures

The survey was administered through an online survey platform (Qualtrics Inc, Provo UT) or via paper during pre-season baseline concussion testing. The survey was based on items previously validated (Register-Mihalik et al., 2013) and is described in detail in a previous study (Register-Mihalik et al., 2018). The items included questions concerning basic demographics, concussion history and disclosure information, and sport participation. In addition, behavioural factors of interest included: 1) multi-item yes-and-no measures on concussion knowledge; 2) multi-item scale measures on attitudes and perceived social norms; and 3) single-item scale measures for intention to disclose and control over concussion disclosure. Higher scores on all measures of interest indicated more positive outcomes. All multi-item scale measures had an internal consistency (Cronbach's Alpha) of 0.8 or higher.

Perceived social norm questions included perceptions of organization, social referent expectations, and actions concerning concussion. There were seven, 7-point scale (rated 1–7) items resulting in a scale range of 7–49. A higher score represents more positive/favourable perceived social norms (Table 1).

Intention to disclose concussive symptoms was assessed using a single question asking, "When I experience possible concussive symptoms, I intend to report them to a medical professional or someone in authority." Responses on the 7-point scale (rated 1–7) were grouped by a higher score of 6 or 7, reflecting agree or strongly agree for intention to disclose vs. a lower score of 1–5, reflecting lower levels of agreement or

Table 1. Perceived social norm items.

Question: Directly listed below as asked in the survey (rated on a 1–7 scale with 7 being more favourable)

- In my current activity or sporting environment, most people I know would report their possible concussive symptoms to a medical professional or someone in authority if they experience them.
- Schools like mine provide appropriate care for individuals with a concussion.
- If I suffered a concussion, I would feel supported by my school.
- When I experience concussive symptoms, I am expected to report them to a medical professional or someone in authority.
- When I experience possible concussive symptoms, people who are important to me would approve of me reporting them to a medical professional or someone in authority.
- When other athletes I know experience possible concussive symptoms, they report them to a medical professional or someone in authority.
- I should report possible concussive symptoms, when I experience them to a medical professional or someone in authority.

disagreement for intention to disclose. We dichotomized intention in this way to remain consistent with previous literature (Register-Mihalik et al., 2018). Additionally, this was a theoretical cut, with those reporting 6 or 7 indicating higher intention vs. those reporting lower agreement towards intention.

The remaining three disclosure outcomes were calculated based on additional questions regarding concussion history and disclosure for those who indicated a history of concussion: 1) number of concussions disclosed at the time of injury divided by the number of concussions (if ratio = 1, then yes to all disclosed at time of injury); 2) number of concussions disclosed at some point divided by number of concussions (if ratio = 1, then yes to all disclosed eventually); and 3) ever participated with signs and symptoms of concussion (yes/no).

Statistical analysis

Frequencies and proportions were calculated for all categorical variables of interest for the full sample and among those with a reported concussion history. Descriptive statistics, inclusive of means and standard deviations, were computed for all continuous variables and outcomes of interest. Specifically, proportions were calculated for each of the four primary disclosure outcomes. Missing data were not considered in the computation of frequencies and proportions and sample size was presented for all variables. The primary outcomes were: 1) intention to disclose concussive symptoms (high/low); 2) disclosed all concussions at time of injury (yes/no); 3) eventually disclosed all concussions (yes/no); and 4) did not participate with signs/symptoms (yes/no).

A multivariable log-binomial regression model for each disclosure outcome was utilized with perceived social norms as the primary predictor. Gender and previous concussion history served as covariates in all four models. We modelled the positive (healthy behaviour) of each disclosure outcome. Missing data were excluded in the models on an analysis-by-analysis basis. The estimated prevalence ratio (PR) associated with each positive disclosure outcome for perceived social norms represents the change in reporting prevalence that occurs for every 10% increase in the score. For example, this 10% increase corresponds to a shift of 4.9 points on the perceived norms scale (range: 7 to 49). For the covariates of gender and previous concussion history, the PRs represent group

comparisons for all categorical variables. For the multivariable models, the a priori alpha level was set to 0.05.

Results

The study sample (n = 389 included in analyses, 2 student-athletes excluded due to missing concussion-related information) was predominantly male and from a military service academy. Table 2 outlines the descriptive statistics for the total sample and the sample subset with a reported concussion history. A variety of sports were represented, with football being the highest proportion (13%). In the sample, 81.5% (313/384) reported higher intention to disclose concussion symptoms. In addition, 73.8% (287/389) reported no previous concussions and 74.8% (288/385) reported never participating while symptomatic from a concussion.

There were 102 student-athletes with a previous concussion (26.2% of total sample). Of those, 76.5% disclosed all recalled concussions at the time of injury and 80.4% disclosed all at some point. However, just 41.6% reported never participating while symptomatic from a concussion.

Perceived norms (mean = 42.2; 95%CI: 41.1–43.4; max = 49) and intention to disclose (mean = 5.7; 95%CI: 5.4–6.0; max = 7) were relatively positive. Table 3 includes statistics for perceived social norms by each disclosure outcome.

Table 2. Demographics and concussion characteristics for the total sample and those with prior concussion history (n = 389)^a.

| | n (%) within full sample (n = 389) | n (%) within sample reporting at least one previous concussion (n = 102) |
|---|------------------------------------|--|
| <i>School</i> | 389 (100.0) | 102 (100.0) |
| Service academy | 281 (72.2) | 76 (74.5) |
| Traditional university | 108 (27.8) | 26 (25.5) |
| <i>Gender</i> | 376 (100.0) | 98 (100.0) |
| Female | 129 (34.4) | 26 (26.5) |
| Male | 247 (65.6) | 72 (73.5) |
| <i>High school athlete status</i> | 375 (100.0) | 97 (100.0) |
| Full or partial contact sport | 325 (86.4) | 91 (92.9) |
| Non-contact sport | 50 (13.6) | 6 (7.1) |
| <i>Ethnicity</i> | 358 (100.0) | 92 (100.0) |
| Hispanic | 35 (9.8) | 8 (8.7) |
| Non-Hispanic | 323 (90.2) | 84 (91.3) |
| <i>Race</i> | 375 (100.0) | 97 (100.0) |
| Caucasian | 278 (73.7) | 70 (72.2) |
| Non-Caucasian | 97 (26.3) | 17 (27.8) |
| <i>Socioeconomic status</i> | 375 (100.0) | 97 (100.0) |
| High | 310 (82.7) | 78 (80.4) |
| Low | 65 (17.3) | 19 (19.6) |
| <i>Concussion education history</i> | 388 (100.0) | 102 (100.0) |
| Yes | 304 (78.4) | 94 (92.2) |
| No | 84 (21.6) | 8 (7.8) |
| <i>Perceived control over concussion disclosure</i> | 385 (100.0) | 101 (100.0) |
| Higher (6–7) | 353 (91.7) | 89 (88.1) |
| Lower (<6) | 32 (8.3) | 12 (11.9) |
| <i>Intention to disclose concussive symptoms</i> | 384 (100.0) | 102 (100.0) |
| Higher (6–7) | 313 (81.5) | 70 (68.6) |
| Lower (<6) | 71 (18.5) | 32 (31.4) |

^aSample sizes differ for variables due to missing data.

Table 3. Concussion behavioural construct means and 95% confidence intervals by concussion disclosure outcome group.

| | n | Perceived concussion norms (range: 7 to 49) |
|--|-----|--|
| Intention to disclose concussive symptoms | | |
| Higher (6–7) | 313 | 44.85 (44.44, 45.27) |
| Lower (<6) | 71 | 37.14 (35.76, 38.52) |
| Disclosed all concussions at time of injury | | |
| Yes | 78 | 43.00 (41.79, 44.21) |
| No | 24 | 39.79 (36.82, 42.76) |
| Disclosed all concussions eventually | | |
| Yes | 82 | 42.90 (41.72, 44.08) |
| No | 20 | 39.55 (36.11, 42.99) |
| Did not participate in sports while symptomatic | | |
| Yes | 42 | 44.50 (43.14, 45.86) |
| No | 59 | 40.66 (38.98, 42.33) |

Multivariable models

There was no association between perceived social norms or the covariates with disclosing all concussions at the time of injury or disclosing all concussions at any point. However, more positive perceived social norms were associated with improved prevalence of higher intention to disclose concussion symptoms (50% improved prevalence per 10% increase in perceived social norms score) and of never participating with concussion symptoms (34% improved prevalence for every 10% increase in perceived social norms score) (Table 4).

Discussion

Consistent with an emerging body of literature (Kroshus et al., 2014, 2015; Register-Mihalik et al., 2013, 2013, 2016), our data support the recommendation that an optimal social environment, supportive of concussion identification and disclosure is consistently associated with positive concussion disclosure behaviours. Given our sample, this appears

Table 4. Multivariable models for perceived social norms and their association with concussion disclosure outcomes.

| | Prevalence Ratio | 95% Confidence Interval | p-value |
|---|------------------|-------------------------|---------|
| Higher intention to disclose concussion symptoms (n = 366) | | | |
| Female (Yes vs. No) | 0.83 | 0.11, 5.92 | 0.849 |
| Concussion History (Yes vs. No) | 0.90 | 0.69, 1.18 | 0.471 |
| Perceived Norms (10% increase in score) ^a | 1.34 | 1.18, 1.53 | <0.001 |
| Disclosed all the time of injury (n = 95) | | | |
| Female (Yes vs. No) | 0.89 | 0.53, 1.52 | 0.679 |
| Concussion History (3+ vs 1–2) | 0.68 | 0.24, 1.91 | 0.471 |
| Perceived Norms (10% increase in score) ^a | 1.10 | 0.88, 1.35 | 0.398 |
| Disclosed all at some point (n = 95) | | | |
| Female (Yes vs. No) | 0.90 | 0.54, 1.51 | 0.705 |
| Concussion History (3+ vs. 1–2) | 0.66 | 0.24, 1.83 | 0.425 |
| Perceived Norms (10% increase in score) ^a | 1.10 | 0.89, 1.34 | 0.385 |
| Never participated while symptomatic (n = 94) | | | |
| Female (Yes vs. No) | 0.55 | 0.24, 1.26 | 0.156 |
| Concussion History (3+ vs. 1–2) | 0.26 | 0.03, 1.92 | 0.186 |
| Perceived Norms (10% increase in score) ^a | 1.50 | 1.07, 2.10 | 0.018 |

^aThe 10% increase in score corresponds to an increase of 4.9 on the perceived norms scale (range: 7 to 49).

especially important among first-year student-athletes who are at a pivotal time period to form appropriate expectations and norms concerning concussion disclosure. In sport, the social environment may be supported by key stakeholders modelling ideal behaviours of concussion symptom disclosure prior to and throughout the injury and recovery process. In addition, our data illustrate that concussion disclosure decisions are not a discrete act, but they may be better represented as a series of decisions beginning with intention and continuing throughout the injury and recovery process. Thus, the supportive social environment should be considered not only as a preventative mechanism, but as a facilitator throughout the entire recovery process.

Multiple disclosure decisions

Similar to Register-Mihalik et al. (2013) we examined concussion disclosure in the context of multiple metrics, while considering demographic factors to understand critical concussion disclosure behaviours. While over 80% of our sample had higher intentions to disclose, only 70% of those suffering a concussion disclosed at time of injury. Additionally, only 41.6% of those with a concussion history reported never participating with signs and symptoms of concussion (meaning nearly 60% did participate at least once with signs/symptoms of concussion). Consistent with previous data (Kroshus et al., 2014, 2015) the current study highlights that even when disclosure intention is high, many student-athletes may not refrain from sport participation while experiencing symptoms of concussion. Data from a high-school cohort (Register-Mihalik et al., 2017) observed similar findings, with many more individuals admitting continuing to play with symptoms vs. indicating they had suffered a previous concussion. One of the primary reasons for disclosure or non-disclosure may be due to a lack of perceived severity of injury. Specifically, factors such as mechanism of injury (Chandran, Elmi, Young, & DiPietro, 2019; Kaminski, Thompson, Wahlquist, & Glutting, 2019) and initial symptom burden and duration (Cuff et al., 2019; Howell, O'Brien, Fraser, & Meehan, 2018) should be considered along with the social environment to improve disclosure.

Much of the focus around concussion education has been disclosure at the time of injury and if not then, at least at some point following injury. This is an important first step towards these injured student-athletes entering a medical pathway of care. However, little focus has been placed on understanding the continuous process of disclosure across the injury and recovery continuum. Important research has shown that the earlier an injury is disclosed, the faster and better the recovery. (McCrary et al., 2017)

Our sample included first-year student-athletes. As such, many of these perceptions and concussion-events were present during their high school sport participation, shaping their current views and actions. Thus, the time period in which athletes transition to their new environment may serve as an optimal time for education and training initiatives that support initial disclosure and reinforce the importance of not participating while still symptomatic. These efforts may include increased medical professional presence when possible during concussion-risk activities, coaches and key stakeholders consistently being present during education sessions, ensuring positive messages about concussion are being relayed to student-athletes, and supportive language and actions by coaches and teammates when an individual suffers a concussion.

Perceived norms and intentions to disclose concussion symptoms

Our primary finding was the consistent relationship between perceived social norms and disclosure behaviours that held in the multivariable models with covariates for two of our four key outcomes. This suggests the need to improve misperceived or actual norms and support the few earlier studies underpinning the importance of perceived norms among student-athletes. (Kroshus et al., 2015; Register-Mihalik et al., 2018) These findings theoretically align with the Theory of Planned Behaviour supporting the role of norms and intentions (Fishbein & Ajzen, 2010) and actual behaviours. Additionally, the data reinforce the importance of intervening at multiple levels of the Socioecological Model (Craig et al., 2019; Kerr et al., 2014; Register-Mihalik et al., 2017) to ensure perceived norms provide a social environment supportive of concussion disclosure. Given our sample of first-year student-athletes, this may be especially important as first-year student-athletes are relying on what they learned from high school and potentially what they are being told about their new higher education environment that may include inaccurate information.

One strategy for improvement is for coaches, teammates, parents, and others in the athletic environment to model healthy disclosure behaviours and to respond in a supportive manner initially following concussion and throughout the recovery process. These responses affect the injured athlete, as well as those observing in the social environment. (Baugh, Kroshus, Daneshvar, & Stern, 2014; Kroshus et al., 2015) This may be particularly important as first-year NCAA student-athletes, regardless of institutional setting, are attempting to assimilate into their new environment and reconcile normative differences and expectations between high school and their new college environment. Lastly, similar to previous work (Kroshus et al., 2015), our data support a social norms approach to concussion education, where misperceived norms are corrected and key positive disclosure behaviours are modelled to promote healthy concussion disclosure behaviours.

Limitations

Our study is limited by being cross-sectional in nature; future work should examine disclosure in a serial fashion not only over the course of a season, but at specific points across the injury process. In addition, as with any survey, response bias is an issue. However, we believe due to our high response rate, we have eliminated as much of this bias as possible. Lastly, our sample is from only two NCAA institutions and consists of only first-year student-athletes. However, there is significant education provided during the entry point to NCAA athletics and we feel our findings provide an important perspective on necessary targets during this critical transitional time to set student-athletes on a path towards healthy concussion disclosure behaviours.

Conclusions

A supportive social environment that models and supports appropriate concussion disclosure behaviours is associated with improved concussion disclosure. Given our sample of first-year student-athletes, these data support the need for appropriate care and

a supportive social environment prior to and during the transition to the collegiate sport environment. In addition, concussion disclosure and identification behaviours should be monitored beginning with intentions to disclose and across the continuum of recovery. Despite initial disclosure, individuals may participate in their sport at some point post-injury in the presence of concussion symptoms. Education and environmental supports concerning continued disclosure are key to optimizing identification of concussion and concussion symptoms among NCAA student-athletes.

Practical applications

Concussion disclosure should be addressed at multiple levels of the college/university environment to provide an optimal social environment and to promote improved concussion identification and disclosure among student-athletes. Education and environmental supports concerning continued disclosure are key to optimizing identification of concussion and concussion symptoms among NCAA student-athletes.

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